

S 1015/040

SALT-TOLERANT FORAGE TRIAL
PLANTED APRIL 8, 1991
RICHARD SNOWBALL FARM, ELMO

Ten varieties of salt tolerant forages were planted using a modified John Deere Flexi-Planter drill supplied and operated by Howard Horton of the Agricultural Research Service, Logan. Thirty 40 foot-long rows of each variety were planted (ten-row blocks were repeated three times). The plot will be sprinkle-irrigated with a handline.

The following varieties were planted: Garrison Creeping Meadow Foxtail, Magnar Basin Wildrye, Revenue Slender Wheatgrass, Tall Wheatgrass, Fawn Tall Fescue, Shoshone Creeping Beardless Wildrye, Prairieland Altai Wildrye, Monarch Cicer Milkvetch, NewHy (a quackgrass-bluebunch wheatgrass hybrid), and San Luis Slender Wheatgrass. The following descriptions are taken from the Interagency Planting Guide for Utah:

Wheatgrass, tall (Introduced) ✓

This is long-lived, tall, vigorous, very late-maturing bunchgrass. Established plants are tolerant of salt, alkali and high water tables. It starts growing early in the spring and reaches maturity in late summer. Reported to be the latest maturing wheatgrass. Palatability is fair early in the season, but the mature plant becomes very unpalatable and must be managed so it is utilized at earlier stages of growth. It does not tolerate continuous close grazing. Old coarse growth often prevents grazing of current growth. It is a good winter forage for livestock, especially horses, when supplemental protein is provided. It is adapted to a very wide range of soils and climates and is a useful erosion control species on critical areas. It does well in salty areas where greasewood and saltgrass grow, where the water table is a few inches to several feet below the surface. It is also suited to favorable, intermediate sagebrush, mountain-brush, and pinyon-juniper sites because of its drought tolerance. Recommended planting depth is 1/4 to 3/4 inch. Adapted varieties are "Alkar"-north, "Jose"-south.

Wheatgrass, slender (Native) ✓

This is a short-lived bunchgrass with good seedling vigor and moderate palatability. It is valuable in erosion-control seed mixes because of its rapid development, salt tolerance, and compatibility with other species. It tolerates a wide range of conditions and adapts well to high altitude ranges and more favorable sites on mountain-brush areas. Excellent in aspen and tall mountain brush. Recommended planting depth is 1/2 to 3/4 inch. "Revenue" is a Canadian variety, selected for salinity tolerance, seed set, and forage yield. "San Luis" is a newly released variety adapted to high elevations. "Pryor" has demonstrated good salinity and drought tolerance.

Wildrye, Altai (Introduced) ✓

Altai wildrye is a winter hardy, drought-tolerant, long-lived perennial grass. Seedlings are difficult to establish, but mature plants are very durable. Its good curing qualities and erect growth make it especially useful for late fall and winter grazing. Forage quality is similar to Russian wildrye. It is unique among the adapted cultivated grasses because the roots can penetrate 10 to 14 feet and can utilize moisture at that depth. It is almost as tolerant of salinity as tall wheatgrass. It is adapted to semideserts and grows well on saline soils. Recommended cultivar is "Prairieland."

Wildrye, basin (Native) ✓

A slightly spreading, robust, native grass throughout the western United States. It is tall, coarse, long-lived, highly palatable early, becoming very unpalatable with maturity, but useful for calving pasture and wildlife forage cover. Poor seedling vigor usually results in sparse stands but it is one of the highest producing grasses once established. Mature plants are unpalatable and need to be managed so they are utilized sooner. Avoid close grazing or clipping that may result in heavy plant loss in a single season. Providing protein supplements during winter grazing also makes more effective use of old growth. This plant is adapted to saline or alkaline lowlands, flood plains, and clayey loam soils that receive more than 14 inches of precipitation. It is particularly well suited for many big sagebrush, juniper areas, and performs well throughout the mountain brush zone. Recommended planting depth 1/2 to 3/4 inch. Adapted variety is "Magnar."

Wildrye, beardless (Native) ✓

This cool season perennial rhizomatous grass provides early spring grazing for wildlife and livestock. Its ability to recover rapidly following inundation by spring flooding makes it an important erosion control plant. Salt tolerance makes it a good weed control plant in saline irrigated pastures. It is planted on dryland saline seep discharge areas and can be effectively established on moist alkaline soils at low and medium elevations, and along streams and moist, saline seepy areas. The rainfall where native stands are most abundant ranges from 5 to 9 inches annually. Fall plantings are required because seed must receive a cold treatment to germinate. Germination is poor and seedlings weak and compete poorly with weeds and other grasses in the early developmental stages. However, once established it is very rhizomatous and maintains stands for many years. Recommended variety is "Shoshone."

Milkvetch, cicer (Introduced) ✓

A rhizomatous non-bloating legume that must be inoculated with rhizobium bacteria for successful planting. A heavy seed and forage producer with a forage quality similar to that of alfalfa. It is adapted to lowland areas that receive more than 14 inches of precipitation. Well adapted to sagebrush-grass, pinyon juniper and mountain brush, except in the shade of trees or high shrubs. Recommended planting depth is 1/4 to 3/4 inch. Recommended varieties include "Lutana," and "Monarch."

Fescue, tall (Introduced)

A long-lived, high producing, cool-season bunchgrass suited for use under a wide range of soil and climatic conditions. It tolerates acid to alkaline conditions, is less palatable than other pasture grasses, and may be grazed out of a mixed stand. Suited to irrigated, subirrigated, or moderately wet conditions, as well as dryland areas where the effective precipitation exceeds 18 inches. Best suited for moist alkali areas in the lowlands. Also a high producer in open aspen and subalpine ranges. Planting depth 1/4 to 1/2 inch. Adaptable varieties include "Alta" and "Fawn." "Forager," "Johnstone," "Mozark," and "Martin" are endophyte free cultivars.

"Kenhy" is a hybrid of fescue and perennial ryegrass. It is more palatable than regular strains of fescue, and retains its wide adaptation and resiliency.

NOTE: Fungal endophyte problems can occur when livestock graze tall fescue (especially pure stands); this problem can be greatly reduced, if not eliminated, by using endophyte-free seed at planting time.

Foxtail, creeping (Introduced) ✓

A long-lived cool-season, dense sod-forming grass that is adapted to wetland meadow sites. It has low seedling vigor, but once established spreads readily by rhizomes. It grows early in the spring and leaves remain green until after hard frosts in the late fall. It is very cold tolerant and can persist in areas where the average frost-free period is less than 30 days. Meadow foxtail is adapted to wet and dry meadows, meadowland hay, most high elevation ranges in the subalpine zone and shoreline stabilization on ponds, lakes, streams, and waterways. It is only moderately salt tolerant but produces good quality forage on wet fertile sites where it is usually superior to other wetland grasses such as Reed canarygrass. The only cultivar of this species is "Garrison." Seed is very light and difficult to seed unless rice hulls are used. Planting depth is 1/4 to 1/2 inch.

Snowball Farm Experimental Grass Plot.

Measurement of Plant Development.

Results taken by Dennis Worwood-Utah State University Extension Services
Emery County, UT. and Keith Littlefield-Live Earth Products, Emery, UT.

Application fo Live Earth can be seen on Paragraph 3 of "Brief History of
Snowball Farm Experimental Grass Plot". (attached)

The Live Earth sections showed volunteer Oats, Alfalfa and Sunflowers. The
control sections showed very little if any of the above volunteers. The difference
in the Sunflowers was so dramatic they were measured separatly for future use as
a potential local cash crop.

Randomly tossing a 3sq ft. hoop on the Live Earth treated sections and on the
control sections of the same type of grass. Measuring weights of specific grasses,
sunflowers and weeds.

Yield Results

14 August 1991

Fawn Tall Fescue	Control	Live Earth	Difference
Grass Height Average	12"	19.5"	39% Taller Grass
Grass Weight	4oz	8oz	50% More Grass
Sunflower Weight	3oz	17oz	82% More Sunflower
Weed Weight	12oz	6oz	50% Less Weed

Fawn Tall Fescue (South)	Control	Live Earth	Difference
Grass Weight	5oz	4oz	20% Less Grass
Sunflower Weight	0	6.5oz	-
Weed Weight	31oz	7.5oz	76% Less Weed

Monarch Cicer Milkvetch (North)	Control	Live Earth	Difference
Vetch Weight	.25oz	4oz	94% More Vetch
Sunflower Weight	0	10oz	-
Weed Weight	40oz	11oz	72% Less Weed

Monarch Cicer Milkvetch (South)	Control	Live Earth	Difference
Vetch Weight	0	0	0
Sunflower Weight	0	0	0
Weed Weight	16oz	30oz	46% More Weed

Newhy (South East)	Control	Live Earth	Difference
Grass Weight	.5oz	3oz	83% More Newhy
Sunflower Weight	0	33oz	-
Weed Weight	21oz	5oz	76% Less Weed

Newhy (North Center)	Control	Live Earth	Difference
Grass Weight	1.5oz	8oz	81% More Newhy
Sunflower Weight	0	7	-
Weed Weight	27oz	21oz	22% Less Weed

Newhy (South West)	Control	Live Earth	Difference
Grass Weight	3oz	7oz	57% More Newhy
Sunflower Weight	0	6	-
Weed Weight	22oz	17oz	23% Less Weed

Garrison Creeping Meadow Foxtail (Plugs) Measured at equal distances from the center riser. 2 Plants for each cutting.

	Control	Live Earth	Difference
Grass Weight	1.5oz	4oz	62% More Grass

The Live Earth treated Plugs were Sending out several rhizomes. The control had none.

It should be noted, that all the sections treated with the Live Earth product, visibly shown taller, thicker, greener grasses than the control sections.

Brief History of Snowball Farm Experimental Grass Plot

4/8/91 to 9/23/91

On the 8th of April 1991 we planted nine grasses and one legume on a plot of fair to marginal soil, under sprinklers, on the Richard Snowball farm north of Elmo Utah in Emery county. Those present at the time of planting were Howard Horton, representing Utah State University; Tony Beals, Soil Conservation Service; Dennis Worwood, Emery county extension agent; Dave Taylor and Keith Littlefield of "Live Earth" product; Richard and John Snowball, farm owners.

The soil was tested in several locations in the plot. The PH readings ranged from 8.4 to 8.9 with EC readings of 5.7 to over 20. The soil generally increases in PH and EC from west to east and south to north.

The only soil additive applied was "Live Earth" product (produced in Emery Utah). This was applied at the rate of 1100 lbs/acre in two 8 ft. strips running the entire length of the plot. The first strip was applied 30 ft. in from the north fence and the second strip applied at 55 ft. from the north fence. No commercial Nitrogen or Phosphate was applied at, or before, seeding.

The plot measures 300 ft. long and 50 ft. wide. It is divided into three 100 ft. sections. Each section contains one planting of each variety. The location of each variety within each section was chosen at random. A border of "Newhy" grass surrounds the entire plot. Eight lengths of 3" X 40' center riser sprinkler pipe runs down the center of the entire plot. The first and last sprinkler heads are 7/32" nozzles and the rest are 5/32" nozzles.

The actual planting was done by Howard Horton using a John Deere planter type drill with 5 planters and a packing wheel behind each planter. Seed depth was 3/4 in. for all varieties.

Following is a list of seed varieties:

1. Newhy Grass
2. Fawn Tall Fescue
3. Tall Wheat Grass
4. Prairieland Altai Wildrye
5. Magnar Basin Wildrye
6. Revenue Slender Wheatgrass
7. San Luis Slender Wheatgrass
8. Shoshone Beardless Wildrye
9. Garrison Creeping Meadow Foxtail
10. Monarch Cicer Milkvetch (legume)

First water was applied 4/29/91. Due to cold, dry, and very windy conditions no water was available until this time. Emergence (grass or weeds) was very slow. Until 5/10 nothing was up. Between wind storms the surface was kept damp by 20 minute applications (about .05 in.) every day. By 5/15 all varieties,

except Shoshone and Garrison, were emerging. Shoshone emerged at 30 days after first water and Garrison at 35 days.

By July the weeds were taking over the plot and on 7/14 Roy Johansen of Elmo used a rotory mower to clip the entire plot to a height of 8 inches. We noticed at that time that where the "Live Earth" strips were located the weeds and grass were taller and darker green in color. Sun flowers, for example, were several feet taller in these locations. The plot was again clipped with Roy Johansen's rotory mower on 8/16...this time at about 6 inches of height. Again, at this time, the grasses and weeds appeared to be growing better in the "Live Earth" strips. Also, the ratio of grass to weeds was higher in these strips as measured by Dennis Worwood and Keith Littlefield on 8/14. After the second clipping the grasses tended to grow better than the weeds.

As per Howard Horton's suggestion, on 8/16, 50 lbs/acre available Nitrogen was applied to the north side of the plot (north of the sprinkler line) and 25 lbs/acre available Nitrogen was applied to the south side of the plot. The Nitrogen was immediatly watered down.

Total amount of water applied was close to 27 inches. Of this amount almost 4 inches came in the form of rain from two large storms (1.5 in. on 5/30-31 and over 2.25 in. on 9/5-9). Also, keeping the surface damp until all the varieties were up added to the total. The plot experienced one period of water stress in mid august when water schedules, clipping, and growth measuring combined to delay watering for a short period. No plant stand loss was noticed due to this delay.

At the time of this writing we are planning to fence off the plot to better be able to manage it and to conduct palatability tests on the plot grasses.

SUMMARY

"Live Earth" strips applied 4/8/91 (harrowed down).
Planted 4/8/91.
1st water 4/29/91.
Frequent 20 min/day waterings to keep surface damp.
Emergence 5/10 to 5/20 all varieties except
Shoshone and Garrison which emerged 5/30 to 6/5.
Heavy rain 5/30-31.
1st clipping 7/14/91.
2nd clipping 8/16/91.
Nitrogen applied 8/16/91
Heavy rain 9/5 to 9/9/91

R. P. Snowball

LIST OF PLOT VARIETIES AND THEIR CORRESPONDING NUMBERS

1. NEWHY
2. FAWN TALL FESCUE
3. TALL WHEAT GRASS
4. PRAIRIELAND ALTAI WILDRYE
5. MAGNAR BASIN WILDRYE
6. REVENUE SLENDER WHEATGRASS
7. SAN LUIS SLENDER WHEATGRASS
8. SHOSHONE BEARDLESS WILDRYE
9. GARRISON CREAPING MEADOW FOXTAIL
10. MONARCH CICER MILKVETCH (LEGUME)

11-4-91

There are 75 lbs of ALFALFA
SANDWICHED 29% DRY MATTER

**FORAGE YIELD, RICHARD SNOWBALL PLOT
MEASURED OCTOBER 11 AND 25, 1991**

Varieties in order of production--average pounds per acre, air dry weight.

	<u>Variety</u>	<u>Average Yield</u>
1.	Tall Wheatgrass	2430
2.	Fawn Tall Fescue	2335
3.	Newhy	1374
4.	Revenue Slender Wheatgrass	1238
5.	Garrison Creeping Meadow Foxtail	894
6.	Magnar Basin Wildrye	882
7.	San Luis Slender Wheatgrass	871
8.	Shoshone Beardless Creeping Wildrye	773
9.	Prairieland Altai Wildrye	637
10.	Monarch Cicer Milkvetch	526

Table 1.

FORAGE YIELD, RICHARD SNOWBALL PLOT
MEASURED OCTOBER 11 & 25, 1991

POUNDS PER ACRE, AIR DRY*

VARIETY	25 lbs. Nitrogen	50 lbs. Nitrogen	Live Earth + 25 lbs. Nitrogen	Live Earth + 50 lbs. Nitrogen
Revenue Slender Wheatgrass	980	1262		1473
San Luis Slender Wheatgrass	682	728		1204
Tall Wheatgrass, Variety Unknown	1726	2220		3344
Monarch Cicer Milkvetch	241	415		922
Garrison Creeping Meadow Foxtail	560	716		1407
Fawn Tall Fescue	1499	2201		3303
Newhy (Quackgrass x Bluebunch Wheatgrass)	1003	1366	1581	1752
Prairieland Altai Wildrye	418	534		960
Magnar Basin Wildrye	554	769		1322
Shoshone Beardless Creeping Wildrye	531	943		847

*Two samples were weighed wet and allowed to dry for 10 days. Dry weight was 29% of wet weight.

**FORAGE YIELD, RICHARD SNOWBALL PLOT
MEASURED OCTOBER 11 & 25 1961**

GRAMS, WET WEIGHT*

VARIETY	25 lbs. Nitrogen	50 lbs. Nitrogen	Live Earth + 25 lbs. Nitrogen	Live Earth + 50 lbs. Nitrogen
Revenue Slender Wheat				
West Replication	604	672		740
Middle Replication	242	276		448
East Replication	168	358		336
San Luis Slender Wheat				
West Replication	410	318		688
Middle Replication	188	234		312
East Replication	106	202		244
Tall Wheatgrass, VNS				
West Replication	722	1220		1474
Middle Replication	570	596		738
East Replication	492	480		1248
Newhy				
West Replication	472	658	524	698
Middle Replication	336	426	550	474
East Replication	230	330	562	640
Monarch Cicer Milkvetch				
West Replication	166	374		564
Middle Replication	40	4		192
East Replication	44	50		198
Garrison Creeping Meadow Foxtail				
West Replication	340	280		508
Middle Replication	238	362		446
East Replication	0	98		500
Fawn Tall Fescue				
West Replication	570	1004		1288
Middle Replication	566	706		820
East Replication	416	568		1308
Prairieland Altai Wildrye				
West Replication	162	174		242
Middle Replication	192	230		454
East Replication	78	148		296
Magnar Basin Wildrye				
West Replication	344	432		766
Middle Replication	168	242		310
East Replication	62	120		292
Shoshone Creeping Beardless Wildrye				
West Replication	296	528		472
Middle Replication	146	236		182
East Replication	108	212		222

*Grams of forage clipped in a standard 9.6 square foot forage sampling hoop.

THIS IS THE RAW DATA FOR STATISTICAL

WESTERN ANALYTICAL, INC.
2417 SOUTH CONSTITUTION BLVD.
SALT LAKE CITY, UTAH 84119-1225
PH. (801) 973-9238 FAX (801) 973-7635

CERTIFICATE OF ANALYSIS

February 26, 1991
P91-083
YOUR PURCHASE ORDER: VERBAL

LIVE EARTH PRODUCTS, INC.
MR. KEITH LITTLEFIELD
P.O. BOX 76
EMERY, UTAH 84522

Dear Mr. Littlefield:

Transmitted herewith are the analytical data for the two (2) samples delivered to our laboratory for 30 E-ICP, P, N, S, and K analysis.

SAMPLE IDENTIFICATION	P (%)	N (%)	S (%)	K (%)
Liquid	< 0.005	0.943	0.31	0.192
Fines	< 0.005	0.770	1.86	0.372

E. H. PHILLIPS
Laboratory Director

Charges: \$173.00 Prepaid

EHP/tp

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30 ELEMENT SEMI-QUANTITATIVE ICP SCAN

ELEMENT	WAVELENGTH (nm)	SAMPLE: "Liquid" (%)	SAMPLE "Fines" (%)
Arsenic	193.70	< 0.005	< 0.02
Zinc	213.86	0.002	0.018
Cadmium	214.44	< 0.002	< 0.002
Lead	220.35	< 0.005	< 0.02
Nickel	231.60	< 0.002	0.003
Barium	233.53	0.003	0.020
Iron	259.94	0.27	2.5
Manganese	257.61	< 0.002	0.002
Magnesium	285.21	0.019	0.15
Vanadium	290.88	< 0.002	0.005
Beryllium	313.04	< 0.002	< 0.002
Copper	324.75	< 0.002	0.013
Aluminum	396.15	0.18	1.5
Barium	455.40	0.002	0.019
Sodium	589.59	0.005	0.05
Lithium	670.78	< 0.005	< 0.05
Strontium	407.77	< 0.002	0.003
Bismuth	223.06	0.009	< 0.02
Boron	249.77	0.050	0.40
Silicon	251.61	0.015	0.13
Cobolt	230.79	< 0.005	< 0.005
Platinum	265.95	< 0.002	< 0.02
Silver	328.07	< 0.002	< 0.005
Calcium	317.93	0.04	0.33
Palladium	340.46	< 0.002	< 0.02
Sellenium	196.03	< 0.002	< 0.02
Molybdenum	202.02	< 0.002	< 0.005
Chromium	205.55	< 0.002	< 0.005
Antimony	206.83	< 0.002	< 0.02
Thallium	351.92	< 0.002	< 0.02

< = less than the value shown
> = greater than the value shown